

REMARKS/ARGUMENTS

The claims are 1-7, which have been rejected under 35 U.S.C. 103(a) as being unpatentable over *Jacob U.S. Patent No. 5,221,233* in view of *Ernst U.S. Patent No. 198 37 471* . Claims 1-7 were also rejected under 35 U.S.C. 103(a) as being unpatentable over *Aucktor U.S. Patent No. 3,475,924* in view of *Ernst*. Essentially, the Examiner's position was that *Jacob* discloses the Rzeppa or universal joint recited in the claims except that the inner hub 9 is an integral component instead of one comprising two separate elements, that *Ernst DE '471* shows a universal joint having an inner hub comprising two separate elements, and that it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the universal joint of *Jacob* by making the hub from two separate elements in order to make production of the universal joint easier and quicker as taught by *Ernst*. The rejection based on *Aucktor* in combination with *Ernst* is similar.

This rejection is respectfully traversed and reconsideration is expressly requested.

As set forth in claim 1, Applicants' invention provides a Rzeppa joint that has a drive side end and a power take-off side end having, *inter alia*, an inner hub that includes at least two elements that are connected with one another. The two elements

lie essentially one behind the other on the inner hub axis, and of which a first element has the first inner running grooves and a second element has the second inner running grooves. In this way, Applicants' invention provides a Rzeppa joint in which it is possible to insert half of the balls into the outer hub along with the cage, and for the insertion of the remaining balls into the cage as well it is unnecessary to move the cage into a suitable insertion position outside the outer hub for each ball, thereby facilitating assembly of the Rzeppa joint.

Neither of the primary references to *Jacob* and *Aucktör* discloses or suggests a Rzeppa joint having the structure recited in Applicants' claim 1, wherein the inner hub includes at least two elements that are connected with one another, which lie essentially one behind the other on the inner hub axis and of which a first element has the first inner running grooves and a second element has the second inner running grooves. Although the Examiner has taken the position that the secondary reference to *Ernst* discloses a joint having an inner hub made up of two separate elements 9, 9' which lie essentially one behind the other, it is respectfully submitted that there is no disclosure or suggestion in *Ernst* of a first element having the first inner running grooves and the second element of the inner hub having the second inner running grooves as recited in Applicants' claim 1.

As depicted in FIGS. 3a, 3c and 3d of *Ernst*, each running groove 7 of the inner hub is defined by two parts 13, 13' of the running groove which together form the running groove. As further explained in column 4, lines 45 to 65 of *DE '471 Ernst* (see machine translation at pages 2-3 of *Ernst* attached hereto), each inner running groove 7 of inner hub 3 is defined by a part 13 of element 9 and a second part 13' of the second element 9'. In other words, the two separate elements 9, 9' do not include a full inner groove but only parts of this inner groove. Thus, none of the elements defining the inner hub of *Ernst* has a full inner running groove as recited in Applicants' claim 1.

Moreover, it is respectfully submitted that Applicants' Rzeppa joint as recited in claim 1 has considerable advantages over the joint as proposed in *Ernst*, particularly when taking into account that the running grooves have to be formed with a very high precision to avoid either loosening or stacking of the balls which are guided in the inner grooves. If a groove is made up of two different parts, impreciseness of the geometry of the groove is difficult to avoid. Thus, it is respectfully submitted that a person skilled in the art would not combine the teaching of *Ernst* to improve a joint known for example, from either *Jacob* or *Aucktor*.

Accordingly, it is respectfully submitted that claim 1 is

patentable over the cited references together with claims 2-7,
which depend directly or indirectly thereon.

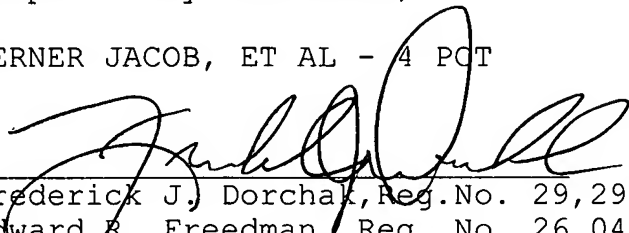
In view of the foregoing, it is respectfully requested that
the claims be allowed and that this case be passed to issue.
requested.

Respectfully submitted,

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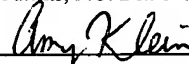
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The invention relates to a method to the preparation of a wave joint with a joint outer part and at least a Hinterschnidungen, recesses and/or profiles exhibiting joint interior for internal Kugelbahnen for the admission in the joint outer part.

Wave joints of this kind are well-known. They serve particularly for the torque transmission between shafts, which are subjected in the enterprise larger misalignments. Also the admission of axial misalignments are possible thereby.

An example of the transmission of torque shafts bended over against each other is the equal course shaft alike. Equal course shaft joints belong to the kind of the Zapfengelenke, whose most usual building method is the universal joint. With the universal joint the fork-type joints of the two shafts are connected with a trunnion. Simple universal joints permit essentially small angle changes. However axial and radial offsets of the shafts are not possible. The moreover with homogeneous angular speed homogeneous speeds on the drift side are produced. The same applies to the torques. The drive shaft avoids these disadvantages. This consists of two joints and a intermediate shaft. The intermediate shaft is usually implemented as telescopic shaft to the reconciliation of length variations. Condition for homogeneous transmission is that the two fork-type joints lie in one level and, if the deflection angles at both fork-type joints are always equally large at least in the situation most frequently occurring in the enterprise. This can be achieved by Z or W-arrangement. With motor vehicles usually the first is usual. Distortions arise only in the intermediate shaft. In order to adjust on small area large angular movement, for example with the front wheel drive of motor vehicles, one uses double joints. These correspond in principle to the drive shaft, however only a short intermediate piece - shaft or sleeve - is present instead of the intermediate shaft, which is so led that the scan angles of both joints are always alike. The longitudinal relocatability is planned in on or output shaft. Besides equal course joints make a homogeneous, actuated transmission possible of the torque and/or. the angular speed usually over balls, which are so led in Kugelbahnen that they always lie in the mirror plane of the joint. With larger equal course joints a centring is necessary. The equal course joints make homogeneous transmission possible with large scan angles. Equal course joints are built as solid joint or shifting joint, whereby the solid joint the drive axle fixed in axial direction and the shifting joint makes a reconciliation possible by Längsverschiebung with oh length variations.

Wave joints of this kind are connected with a joint outer part and a joint interior with the shafts. The joint interior is led across balls on the joint outer part. The balls move thereby in a cover ring in Kugelbahnen, which are formed out on the outer surface of the joint interior and on the internal surface of the joint outer part. Geometry of the wave joints requires that the recesses for the Kugelbahnen are cutting angeformt. This requires usually costly, highly precise, cutting treatment. With the fact it is unfavorable that the joint interior in a multiplicity of work procedures and in different processing machines must be manufactured. So far the joint interior on conventional of ways was formed out of a blank, since the Hinterschnidungen or forming out was not to be manufactured in the pressing and so that also from metallic powder compressed and sintered could not be brought to the end form. This required usually additional process steps, in order to reach the shaping of the Hinterschnitte.

- ▲ top Task of the invention is it to make a method available with which in simple way a wave joint can be manufactured, in particular an equal course shaft joint is made available, which is accessible to simple pressings due to its geometry.

The task is solved by the fact that joint interior and/or joint outer part are built up from at least two corresponding, preferably circular joint bodies. The invention it is the basis that a body with complex geometry can be divided by one or more cuts in one or more bodies with simpler geometry. With the available joint interior and/or joint outer part it is intended with the fact that geometry of the individual joint bodies is in such a manner arranged that at least two essentially identical joint bodies with simply pressing geometry, with their respective contact surfaces can be arranged in such a way that a joint interior and/or a joint outer part with appropriate complex geometry develop.

It is intended that the joint bodies can be preferably interconnected to plumb lines, welding and/or sinters (material conclusion) by joining processes, by putting (form closure). It is also possible to arrange and axially fasten the joint bodies in such a way on the respective shaft that they fit together without solid connection among themselves (form closure) and so the joint interior form. It is according to invention intended that the joint body from powdered material, preferably from metallic powder, is compressed in a press device. This joint body exhibits the advantage that with the connection with an appropriate counterpart through the entire body of the joint interior forms a high-strength structure, which exhibits outstanding material properties and surface quality for sinters. The moreover a method is intended, compressed with which the joint bodies become as blank in a press device also toward the joint body axle movable stamps. A such press device is characterised by a simple work routine. This Pressvorgang is economical and above all time-saving. It becomes thereby possible, within a short time a large number of items at joint bodies and/or. To manufacture joint interior. The moreover a method is subject-matter of the invention, according to which the joint body is manufactured in one or more Pressvorgängen. Thereby it is possible to make between individual Pressvorgängen changes in the formed body as well as in the tool in order to use individual organization possibilities.

joint body 9 exhibits Kugelbahnen 7, which get over the contact surface 10. The Kugelbahnen 7 are represented only in each case to the half with a course side 13. With the compound joint interior the Kugelbahnen 7 are complete and exhibit in each case course sides 13 and 13'. The corresponding joint body 9', which is not represented here, was attached above the joint body 9 represented by that, opposite to, so that the Kugelbahnen 7 form an edge in the course reason of 12.

Fig. 3d represents an expiration of a plan view from the side on the joint interior 3, which is compound from the joint bodies 9, 9'. Here the contact surfaces 10, 10' are drawn with line lines, since they are not visible. The two joint bodies 9, 9' exhibit course sides 13, 13' corresponding in each case, which form the Kugelbahnen 7. Between the course sides 13, 13' is visibly in the course reason 12 edges 19, at those the contact surfaces 10, 10' lies close.

Fig. a Kugelbahn 7 with a ball 6 shows 4 in the cross section. The ball 6 exhibits geometry, which is circular. The Kugelbahn 7 exhibits geometry, which is elliptical. The ball runs on the tread 16, 16' and has thereby in each instant two points of contact on the Kugelbahn. Each point of contact 17, 17' is on another course side 13, 13'. Each course side 13, 13' belongs to another joint body 9, 9'. The edges lie in the course reason (12). The Kugelbahn 7 is in such a way out-arranged that the edges do not cut the tread 16 of the ball 6, but always in the spacing D roll over. The points of contact 17, 17' are separated in the angle 2δ from the ball center.

The contact surfaces 10, 10' of the two joint bodies 9, 9' are represented to the clarity for the sake of with something spacing from each other, in order to show that it concerns two joint bodies 9, 9', which knock against together at this side.